THE ECONOMICS OF
GREENHOUSE
BEDDING PLANTS

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THE ECONOMICS OF GREENHOUSE BEDDING PLANTS PRODUCTION IN ALBERTA 1990

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SECTION I

INTRODUCTION

The Production Economics Branch (PEB) has been monitoring the costs and returns for different farm enterprises since the 1960's. These studies have been viewed as an important tool for assisting producers in their cropping decisions as well as for developing policies and programs for different farm enterprises in Alberta and Canada. Where information gaps existed in other provinces, results from these studies have served as the basis to fill those gaps.

The PEB has been monitoring production costs and returns for the greenhouse industry since the late 1970's. During the last decade, comprehensive studies have been undertaken to document production costs and returns for the various greenhouse crops, by size of operation, and by regions (location of greenhouses). These studies also provide information on the structure of the greenhouse industry, and on the production and marketing problems faced by the greenhouse operators in Alberta.

In the fall of 1990, in consultation with the Extension Greenhouse Specialists, it was decided to concentrate on one crop enterprise greenhouses to develop production costs and returns data. Therefore, seven bedding plants greenhouse operators were selected to obtain the relevant data. Of these, four were selected from the north and north–central regions and three from the southern region.

This report provides information on production costs and returns for producing greenhouse bedding plants in 1990.

Objectives of the Study

The main objectives of this study were:

1) To determine production costs and returns for bedding plants, i.e. per square foot; per flat (72 plants) and per pack (six plants).

2) To document production costs and returns for bedding plants by region.

3) To assist bedding plants producers to improve return to management.

Data Collection and Method of Analysis

A questionnaire was used to obtain the required information from the seven bedding plants greenhouse operators in the province. Size of these operations ranged from over 5,000 to about 25,000 square feet. All of the participants were visited to obtain production costs and returns for the 1990 crop year.

A mainframe computer program "SPSS" (Statistical Package for the Social Studies) was used to analyze the data. This program provides the use with a comprehensive set of procedures for data transformation and file manipulation, and offers the researcher a large number of statistical routines.

Each greenhouse operation was analyzed separately. Individual analyses were sent to the study participants for review of any errors/omissions or missing data and provide feedback before developing group averages.

SECTION II

COMPUTATION OF INDIVIDUAL COST COMPONENTS

Investment Costs

Interest on Investment:

Interest is defined as a sum paid or calculated for the use of capital. The sum is usually expressed in terms of a rate or percentage of the capital involved, called the interest rate.

Interest is charged for the use of investment capital. Had the capital not been invested to buy a specific asset, it could have been used elsewhere, either within or outside the firm, and would have brought some additional return to the firm.

A flat rate of 10 percent was used for the purposes of this study to determine a fair return to land, building and equipment investment. Interest on operating capital was the actual rate of interest paid by the study participants.

Depreciation:

Depreciation is defined as the loss in value of an asset over time, mainly as a result of obsolescence. In the case of buildings and equipment, it is that portion of the decrease in value resulting from the passage of time. Obviously, part of the reduced value of the buildings and equipment is the result of usage and is considered a variable cost. The entire depreciation is considered a fixed cost.

In computing depreciation, a 10 percent allowance or salvage value is taken from the purchase price of the buildings and equipment. The following formula was used in arriving at depreciation for buildings and equipment.

$$\text{Depreciation} = \frac{\text{Purchase Price} - \text{Salvage Value}}{\text{Number of Years of Life}}$$

Land Value:

Land associated with each greenhouse operation was valued at $1,700 per acre, irrespective of its location. This value was determined through real estate values for good farmland suitable for a greenhouse operation. It can be argued that allocation of such a value distorts cost of land in and around urban areas relative to farmland. However, for uniformity and reasonable cost estimates, it was decided to standardize the land value regardless of its location. Researchers are aware that land values in cities or towns are much higher than $1,700 per acre, but if market values were used for land acquired ten years ago, it would lead to artificially high fixed costs that would greatly inflate overall production costs.

Operating Costs

Production Materials and Supplies:

Production materials and supplies included the purchase of cuttings, seed plants, fertilizers, chemicals, soils, vermiculite, perlite, peat moss, straw, peat pots, and plastic. Costs of production materials and supplies were the actual figures provided by the study participants.

Containers, Labels and Tags:

Costs for containers, labels and tags were the actual figures provided by each study participant. These represent a significant cost for a bedding plant operation.

Labour Costs:

Hired labour costs included the amount of wages and any benefits received by the hired workers, such as contributions to Workers' Compensation, Canada Pension Plan, and Unemployment Insurance.

The hours spent by the operator and his/her family in greenhouse production were estimated. An operator's labour was valued at $7.50 per hour, and family labour was valued at either the rate paid to hired labour or the actual amount paid to family members.

Greenhouse Fuel (Heating Costs):

Almost all greenhouse operators had reasonably accurate costs for heating the greenhouses with natural gas. Monthly bills were helpful in arriving at the total heating costs.

Utility Costs:

Utility costs included electricity, telephone, and water. Where the utility bill was combined with the greenhouse operator's residence, the operator was asked to apportion the bill to arrive at total utility costs for the greenhouse operation.

Insurance and Registration Fees:

Insurance and registration fees cover the costs for insuring greenhouse buildings, product, labour and vehicles.

Repairs and Maintenance Costs:

Maintenance costs included repairs to greenhouse structures, boilers, heating equipment, tractors, and all other machinery and equipment associated with the greenhouse operation.

Freight, Leasing and Express:

Freight, leasing and express costs represent costs incurred for either receiving of a shipment or shipping products and leasing of some equipment (vehicles, etc.). It includes charges paid to commercial or private carriers for hauling greenhouse supplies.

Property and Business Taxes:

Taxes on real estate include payments made on the assessed value of the greenhouse operation less any assessment for the greenhouse operator's residence or operations other than the greenhouse. There is a business tax on greenhouses located in urban municipalities. Exact amounts of property and business taxes were included in the costs.

Miscellaneous Costs:

These costs include legal and accounting fees, office supplies, bad debts, donations, membership fees, insurance costs, and other costs incurred in a greenhouse operation but not reported under any other heading.

SECTION III

GREENHOUSE PRODUCTION COSTS AND RETURNS FOR BEDDING PLANTS

Production costs include operating costs, investment costs, depreciation (buildings, equipment and automotives) and operator's labour. For any enterprise or operation to be economically viable, operating costs have to be recovered.

Operating costs represent out–of–pocket costs incurred during the production of bedding plants. Some of the most common operating costs were hired labour; material inputs (growing media, seed/cuttings); repairs and maintenance; containers; labels and tags; greenhouse fuel (heating); and interest on operating capital, etc.

Gross revenue represents sales of bedding plants in various size packs (single pots, six and/or nine plants pack) and in a few cases, some additional sale of supplies (other than bedding plants). In order to better understand unit costs, it was decided to standardize these costs over 72 plants flat and six plants pack.

Average gross revenue for the study sample was estimated at $5.94 per square foot for the 1990 bedding plants crop. It was $22.28 per flat of 72 plants and $1.86 per pack of six plants.

Average operating costs incurred in producing bedding plants during the 1990 crop year are shown in Tables 1, 3 and 5 for the study sample, Group I and Group II, respectively[1]. These costs were $3.88 per square foot, $14.57 per flat (72 plants) and $1.21 per six plants pack for the study sample. Average investment costs amounted to $0.74 per square foot, $2.79 per flat and $0.23 per pack (Table 1).

When operating and investment costs were combined with depreciation and operator's labour, average total production costs were $5.82 per square foot; $21.83 per flat and $1.82 per

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[1] Group I represents the north–west region.
Group II represents the southern and south–central regions.

pack (Table 1). Return over operating costs for the study sample was $2.05 per square foot and $7.71 per flat ($0.64 per pack). Average return to management was $0.12 per square foot, $0.46 per flat and $0.04 per pack.

Average gross revenue for Group I (north–west region) participants was estimated at $6.21 per square foot; $23.19 per flat or $1.93 per pack of six plants. It was $5.38 per square foot; $20.35 per flat or $1.70 per pack for the Group II participants (Tables 3 and 5).

Average production costs (Table 3) for bedding plant producers in the north–central region amounted to $5.75 per square foot; $21.49 per flat ($1.79 per pack). Detailed breakdown on operating and investment costs, depreciation and operator's labour are provided in Table 3. Return over operating costs for bedding plant producers in north–west Alberta was $2.24 per square foot; $8.39 per flat and $0.70 per pack. Return to management was positive for this group at $0.45 per square foot; $1.70 per flat and $0.14 per pack.

Table 5 presents production costs and returns for greenhouses producing bedding plants in southern and south–central Alberta. Average gross revenue for the study participants in Group II was $5.38 per square foot; $20.35 per flat or $1.70 per pack.

Average total operating costs for this Group were estimated at $3.72 per square; $14.09 per flat or $1.17 per pack. Average investment costs amounted to $0.86 per square foot; $3.26 per flat and $0.27 per pack of six plants (Table 5). Average total production costs (operating + investment + depreciation + operator's labour) amounted to $5.96 per square foot; $22.55 per flat or $1.88 per pack.

Average return over operating costs was estimated at $1.66 per square foot; $6.25 per flat of 72 plants or $0.52 per pack. Return to management was negative for Group II participants at $0.58 per square foot, $2.20 per flat or $0.18 per pack six plants. Detailed breakdown on gross revenue and various cost items are given in Table 5.

Investment Costs for Greenhouses Producing Bedding Plants:

Greenhouse investment costs for the 1989–90 crop year were obtained directly from study participants during the survey. Each operator was asked to value the greenhouse structure based on the current market costs of replacement. Study participants were also asked

to provide an estimate of the life of the structure in order to calculate interest and depreciation costs.

Investment costs were calculated on land, buildings, machinery, automotives and other miscellaneous equipment. The rate of interest used for determining interest costs for land, buildings, and equipment was 10 percent. Details on average investment and investment costs for the seven greenhouses producing bedding plants are presented in Table 2

Land Investment:

The average land area associated with the greenhouses, such as building (production area and office) and parking space, was 2.57 acres for the study sample, 3.00 acres for greenhouses in the north and north–central regions, and 2.00 acres for the greenhouses in southern Alberta. Average land investment per greenhouse for the study sample and the two groups (by regions) was $4,371, $5,100, and $3,400, respectively.

Building Investment:

The average building investment based on the market value of the greenhouse facilities studied during 1990 was $97,447 per greenhouse (Group I) for the study sample, $113,715 per greenhouse in the north and north–central regions, and $75,756 per greenhouse for the greenhouses in the southern region (Group II). Details on average investment costs (interest and depreciation) on buildings per greenhouse are given in Tables 2, 4 and 6.

Equipment Investment:

Average equipment investment based on the purchase price was $28,703 per greenhouse for the study sample and $36,767 for Group I, and $17,950 for Group II. Average investment cost for machinery and equipment was $0.17, $0.17, and $0.18 per square foot for the study sample, Group I, and Group II, respectively. Details on investment and investment costs i.e., interest and depreciation on machinery and equipment are presented in Table 2, 4 and 6.

Automotive Investment:

Average investment in automobiles was $13,991 per greenhouse for all of the participants, $17,126 for Group I and $9,810 for Group II. Average investment cost for automotives amounted to $0.10 per square foot for the study sample.

Total Investment and Investment Costs:

Average investment per greenhouse for the seven participants amounted to $144,512 and $172,708 in north and north–central Alberta (Group I), and $106,916 per greenhouse for the participants in southern Alberta (Group II). Average investment per square foot for the study sample was $8.79. Average investment per square foot of greenhouse area for Group I and Group II was $8.87 and $8.62, respectively. Details on total investment and investment costs are provided in Tables 2, 4 and 6.

TABLE 1

PROUCTION COSTS AND RETURNS FOR GREENHOUSES PRODUCING BEDDING PLANTS, ALBERTA

Greenhouse Area (Sq. Ft.) 16442

		Total	Per Sq. Ft.	Per Flat (72 Plants)	Per Six Plant Pack
		----$----	----$----	----$----	----$----
A.	**Returns**				
	Gross Revenue	**97638.25**	**5.94**	**22.28**	**1.86**
B.	Operating Costs				
	Growing Media & Seed/Cuttings	11953.86	0.73		
	Fertilizer and Chemicals	857.86	0.05		
	Containers, Labels and Tags	5073.71	0.31		
	Hired Labour	18966.71	1.15		
	Greenhouse Fuel	4999.29	0.30		
	Utilities[1]	2313.00	0.14		
	Insurance and Reg. Fees[2]	1104.43	0.07		
	Repairs and Maintenance[3]	7156.29	0.44		
	Freight, Leasing and Express	801.14	0.05		
	Taxes	344.71	0.02		
	Office Supplies	766.71	0.05		
	Advertising and Marketing Costs	2432.00	0.15		
	Accounting and Legal	1067.14	0.06		
	Travel, Donations, Memberships	747.00	0.05		
	Miscellaneous[4]	1424.71	0.09		
	Interest on Operating Capital	3860.86	0.23		
	Total Operating Costs	**63869.43**	**3.88**	**14.57**	**1.21**
C.	Investment Costs				
	Interest – Land	371.57	0.02		
	Interest – Buildings	8505.34	0.52		
	Interest – Equipment	2176.66	0.13		
	Interest – Automotive	1157.37	0.07		
	Total Investment Costs	**12210.94**	**0.74**	**2.79**	**0.23**
D.	Production Costs				
	Operating Costs	63869.43	3.88	14.57	1.21
	Depreciation[5]	2820.98	0.17	0.64	0.05
	Investment Costs	12210.94	0.74	2.79	0.23
	Operator's Labour	16781.00	1.02	3.83	0.32
	Total Production Costs	**95682.25**	**5.82**	**21.83**	**1.82**
E.	Management Factors				
	Return Over Operating Costs	33768.86	2.05	7.71	0.64
	Return to Management	1955.97	0.12	0.45	0.04

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[1] Includes Power, Water, Telegram and Telephone

[2] Includes Motor Vehicles, Greenhouse and Labour Insurance

[3] Includes Repair, Maintenance and Fuel Expenses for Equipment, Buildings and Motor Vehicles.

[4] Includes Small Tools, Shop Supplies, Soil Testing and Promotional Expenses other than Advertising.

[5] Includes Depreciation on Buildings, Equipment and Transportation Units.

TABLE 2

INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES
PRODUCING BEDDING PLANTS IN ALBERTA

Building Area (Sq. Ft.)	16442
Land Area (Acres)	2.57
	----$----
Land Value	4371.43
Land Interest	371.57
Land Interest Per Sq. Ft.	0.02
	----$----
Building Investment	97446.81
Building Interest	8505.34
Building Depreciation	1684.46
Total Building Costs Per Sq. Ft.	0.62
Equipment Investment	28702.57
Equipment Interest	2176.66
Equipment Depreciation	670.19
Total Equipment Costs Per Sq. Ft.	0.17
Automotive Investment	13990.86
Automotive Interest	1157.37
Automotive Depreciation	466.74
Total Automotive Costs Per Sq. Ft.	0.10
Total Investment	144511.69
Total Investment Per Sq. Ft.	8.79
Total Investment Costs	15032.30
Total Investment Costs Per Sq. Ft.	0.91

TABLE 3

PRODUCTION COSTS AND RETURNS FOR GREENHOUSES
PRODUCING BEDDING PLANTS IN NORTH-WEST ALBERTA

Greenhouse Area (Sq. Ft.) 19471

		Total	Per Sq. Ft.	Per Flat (72 Plants)	Per Six Plant Pack
		----$----	----$----	----$----	----$----
A.	**Returns**				
	Gross Revenue	**120841.00**	**6.21**	**23.19**	**1.93**
B.	Operating Costs				
	Growing Media & Seed/Cuttings	13891.75	0.71		
	Fertilizer and Chemicals	892.50	0.05		
	Containers, Labels and Tags	4622.00	0.24		
	Hired Labour	22946.00	1.18		
	Greenhouse Fuel	6319.75	0.32		
	Utilities[1]	2782.50	0.14		
	Insurance and Reg. Fees[2]	1535.50	0.08		
	Repairs and Maintenance[3]	9808.00	0.50		
	Freight, Leasing and Express	450.50	0.02		
	Taxes	238.00	0.01		
	Office Supplies	654.25	0.03		
	Advertising and Marketing Costs	2495.00	0.13		
	Accounting and Legal	1391.25	0.07		
	Travel, Donations, Memberships	1094.75	0.06		
	Miscellaneous[4]	1613.00	0.08		
	Interest on Operating Capital	6406.50	0.33		
	Total Operating Costs	**77141.25**	**3.96**	**14.80**	**1.23**
C.	Investment Costs				
	Interest – Land	395.25	0.02		
	Interest – Buildings	9202.65	0.47		
	Interest – Equipment	2462.92	0.13		
	Interest – Automotive	1289.62	0.07		
	Total Investment Costs	**13350.44**	**0.69**	**2.56**	**0.21**
D.	Production Costs				
	Operating Costs	77141.25	3.96	14.80	1.23
	Depreciation[5]	3202.72	0.16	0.61	0.05
	Investment Costs	13350.44	0.69	2.56	0.21
	Operator's Labour	18310.50	0.94	3.51	0.29
	Total Production Costs	**112004.81**	**5.75**	**21.49**	**1.79**
E.	Management Factors				
	Return Over Operating Costs	43699.75	2.24	8.39	0.70
	Return to Management	8836.13	0.45	1.70	0.14

[1] Includes Power, Water, Telegram and Telephone

[2] Includes Motor Vehicles, Greenhouse and Labour Insurance

[3] Includes Repair, Maintenance and Fuel Expenses for Equipment, Buildings and Motor Vehicles.

[4] Includes Small Tools, Shop Supplies, Soil Testing and Promotional Expenses other than Advertising.

[5] Includes Depreciation on Buildings, Equipment and Transportation Units.

TABLE 4

INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES PRODUCING BEDDING PLANTS IN NORTH-WEST ALBERTA

Building Area (Sq. Ft.)	19471
Land Area (Acres)	3.00
	----$----
Land Value	5100.00
Land Interest	395.25
Land Interest Per Sq. Ft.	0.02
	----$----
Building Investment	113715.00
Building Interest	9202.65
Building Depreciation	1822.49
Total Building Costs Per Sq. Ft.	0.57
Equipment Investment	36767.25
Equipment Interest	2462.92
Equipment Depreciation	806.60
Total Equipment Costs Per Sq. Ft.	0.17
Automotive Investment	17126.25
Automotive Interest	1289.62
Automotive Depreciation	573.99
Total Automotive Costs Per Sq. Ft.	0.10
Total Investment	172708.50
Total Investment Per Sq. Ft.	8.87
Total Investment Costs	16553.52
Total Investment Costs Per Sq. Ft.	0.85

TABLE 5

PRODUCTION COSTS AND RETURNS FOR GREENHOUSES
PRODUCING BEDDING PLANTS IN SOUTHERN AND SOUTH-CENTRAL ALBERTA

Greenhouse Area (Sq. Ft.) 12403

		Total	Per Sq. Ft.	Per Flat (72 Plants)	Per Six Plant Pack
		----$----	----$----	----$----	----$----
A.	**Returns**				
	Gross Revenue	**66701.31**	**5.38**	**20.35**	**1.70**
B.	Operating Costs				
	Growing Media & Seed/Cuttings	9370.00	0.76		
	Fertilizer and Chemicals	811.67	0.07		
	Containers, Labels and Tags	5676.00	0.46		
	Hired Labour	13661.00	1.10		
	Greenhouse Fuel	3238.67	0.26		
	Utilities[1]	1687.00	0.14		
	Insurance and Reg. Fees[2]	529.67	0.04		
	Repairs and Maintenance[3]	3620.67	0.29		
	Freight, Leasing and Express	1268.67	0.10		
	Taxes	487.00	0.04		
	Office Supplies	916.67	0.07		
	Advertising and Marketing Costs	2348.00	0.19		
	Accounting and Legal	635.00	0.05		
	Travel, Donations, Memberships	283.33	0.02		
	Miscellaneous[4]	1173.67	0.09		
	Interest on Operating Capital	466.67	0.04		
	Total Operating Costs	**46173.66**	**3.72**	**14.09**	**1.17**
C.	Investment Costs				
	Interest – Land	340.00	0.03		
	Interest – Buildings	7575.60	0.61		
	Interest – Equipment	1794.97	0.14		
	Interest – Automotive	981.03	0.08		
	Total Investment Costs	**10691.60**	**0.86**	**3.26**	**0.27**
D.	Production Costs				
	Operating Costs	46173.66	3.72	14.09	1.17
	Depreciation[5]	2312.00	0.19	0.71	0.06
	Investment Costs	10691.60	0.86	3.26	0.27
	Operator's Labour	14741.66	1.19	4.50	0.37
	Total Production Costs	**73918.87**	**5.96**	**22.55**	**1.88**
E.	Management Factors				
	Return Over Operating Costs	20527.66	1.66	6.26	0.52
	Return to Management	-7217.58	-0.58	-2.20	-0.18

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[1] Includes Power, Water, Telegram and Telephone

[2] Includes Motor Vehicles, Greenhouse and Labour Insurance

[3] Includes Repair, Maintenance and Fuel Expenses for Equipment, Buildings and Motor Vehicles.

[4] Includes Small Tools, Shop Supplies, Soil Testing and Promotional Expenses other than Advertising.

[5] Includes Depreciation on Buildings, Equipment and Transportation Units.

TABLE 6

INVESTMENT AND INVESTMENT COSTS FOR GREENHOUSES
PRODUCING BEDDING PLANTS IN SOUTHERN AND SOUTH-CENTRAL ALBERTA

Building Area (Sq. Ft.)	12403
Land Area (Acres)	2.00
	----$----
Land Value	3400.00
Land Interest	340.00
Land Interest Per Sq. Ft.	0.03
	----$----
Building Investment	75756.00
Building Interest	7575.60
Building Depreciation	1500.41
Total Building Costs Per Sq. Ft.	0.73
Equipment Investment	17949.66
Equipment Interest	1794.97
Equipment Depreciation	488.30
Total Equipment Costs Per Sq. Ft.	0.18
Automotive Investment	9810.33
Automotive Interest	981.03
Automotive Depreciation	323.74
Total Automotive Costs Per Sq. Ft.	0.11
Total Investment	106916.00
Total Investment Per Sq. Ft.	8.62
Total Investment Costs	13004.04
Total Investment Costs Per Sq. Ft.	1.05

SECTION IV

SUMMARY

This section provides a summary of the 1990 costs and returns for greenhouse bedding plants production for the study sample and by region. As mentioned earlier, seven greenhouse operators were surveyed to obtain data for this study.

Group I represents study sample drawn from the north-west region of the province whereas Group II represents greenhouse operators from the southern and south-central regions of the province.

Average gros revenue and a summary of major production costs for the study sample, Group I and Group II participants are presented in Table 7. The major production costs were labour (hired, operator and family), growing media and seed/cuttings, followed by interest (operating and investment) and repairs and maintenance. Relative share of these and other costs for the study sample, Group I and Group II participants is presented in Figure 1.

TABLE 7

SUMMARY OF GREENHOUSE BEDDING PLANTS
PRODUCTION COSTS AND RETURNS, 1990

	Study Sample		Group I		Group II	
Average Area (Sq. Ft.)	16442		19471		12403	
Number of Flats Produced	4382		5211		3278	
	Per Flat (72 Plants)	Per Pack (6 Plants)	Per Flat (72 Plants)	Per Pack (6 Plants)	Per Flat (72 Plants)	Per Pack (6 Plants)
A. GROSS REVENUE ($)	22.28	1.86	23.19	1.93	20.35	1.70
Material Inputs ($)	4.08	0.34	3.72	0.31	4.84	0.40
Hired Labour	4.33	0.36	4.40	0.37	4.17	0.35
Greenhouse Fuel	1.14	0.09	1.21	0.10	0.99	0.08
Other Operating Costs	5.02	0.42	5.47	0.46	4.09	0.34
B. TOTAL OPERATING COSTS ($)	14.57	1.21	14.80	1.23	14.09	1.17
Land, Building and Equipment Interest and Depreciation	3.43	0.28	3.17	0.27	3.96	0.33
C. TOTAL OTHER COSTS ($)	6.62	0.55	6.68	0.55	8.46	0.70
D. TOTAL PRODUCTION COSTS ($)	21.83	1.82	21.49	1.79	22.55	1.88
Return Over Operating Costs ($)	7.71	0.64	8.39	0.70	6.26	0.52
Return to Management ($)	0.45	0.04	1.70	0.14	-2.20	-0.18

DISTRIBUTION OF GREENHOUSE BEDDING PLANTS

PRODUCTION COSTS, 1990

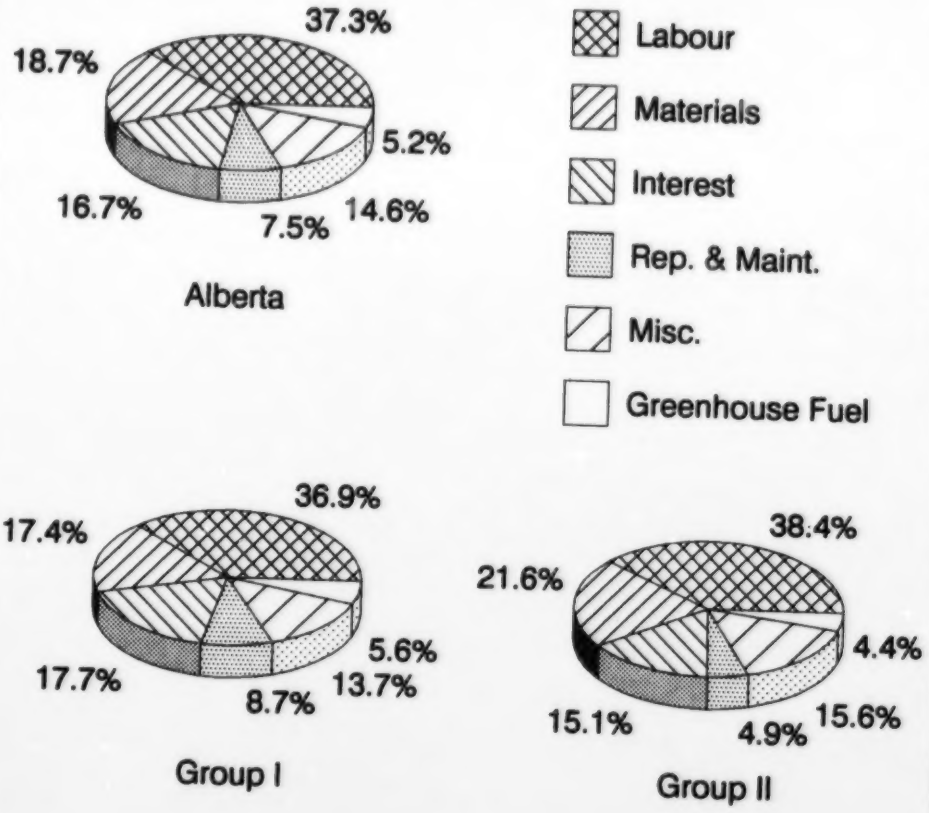

Figure 1